## CIVL 1101

Fall 2021
REVIEW FOR FINAL EXAM

1. A random error of $\pm 0.11 \mathrm{ft}$ is estimated for each of 12 length measurements that are added together to get the total length. What is the estimated total error for the total length?
A. $\pm 0.38 \mathrm{ft}$
B. $\pm 0.33 \mathrm{ft}$
C. $\pm 0.28 \mathrm{ft}$
D. $\pm 0.19 \mathrm{ft}$
E. $\pm 0.01 \mathrm{ft}$
2. What is the distance to the flag pole if the pole is 35.0 ft in height and the measured angle $\alpha=7^{\circ} 45^{\prime} 30^{\prime \prime}$.

A. $\quad 4.87 \mathrm{ft}$
B. $\quad 35.0 \mathrm{ft}$
C. $\quad 100 \mathrm{ft}$
D. 257 ft
E. $\quad 295 \mathrm{ft}$

| Point | BS | HI | FS | Elevation |
| :---: | :---: | :---: | :---: | :---: |
| $\mathrm{BM}_{1}$ | 1.23 |  |  | 100.00 |
| $\mathrm{TP}_{1}$ | 2.25 |  | 4.52 |  |
| $\mathrm{TP}_{2}$ | 6.25 |  | 3.65 |  |
| $\mathrm{TP}_{3}$ | 4.23 |  | 5.21 |  |
| $\mathrm{TP}_{4}$ | 1.47 |  | 8.42 |  |
| $\mathrm{BM}_{2}$ |  |  |  |  |
|  |  |  |  |  |
|  |  | Change in elevation |  |  |

3. Complete and check the above set of level notes and estimate the height of the instrument between points $\mathrm{TP}_{2}$ and $\mathrm{TP}_{3}$.
A. $\quad 102.42 \mathrm{ft}$
B. $\quad 101.58 \mathrm{ft}$
C. $\quad 100.56 \mathrm{ft}$
D. $\quad 97.36 \mathrm{ft}$
E. $\quad 95.48 \mathrm{ft}$
4. Complete and check the above set of level notes and estimate the elevation of point $\mathrm{BM}_{2}$.
A. $\quad 101.02 \mathrm{ft}$
B. $\quad 100.02 \mathrm{ft}$
C. $\quad 98.02 \mathrm{ft}$
D. $\quad 97.35 \mathrm{ft}$
E. $\quad 88.94 \mathrm{ft}$


| Point | BS | HI | FS | Elevation |
| :---: | :---: | :---: | :---: | :---: |
| $\mathrm{BM}_{1}$ |  |  |  |  |
| $\mathrm{TP}_{1}$ |  |  |  |  |
| $\mathrm{TP}_{2}$ |  |  |  |  |
|  |  |  |  |  |
|  |  | Change in elevation |  |  |

5. Develop and check a set of level notes from the above figure. What is the FS at point $\mathrm{TP}_{2}$ ?
A. $\quad 1.34 \mathrm{ft}$
B. $\quad 3.20 \mathrm{ft}$
C. $\quad 4.41 \mathrm{ft}$
D. $\quad 6.71 \mathrm{ft}$
E. $\quad 7.53 \mathrm{ft}$
6. What is the change in elevation between points $\mathrm{BM}_{1}$ and $\mathrm{TP}_{2}$ ?
A. $\quad-16.40 \mathrm{ft}$
B. $\quad-10.69 \mathrm{ft}$
C. $\quad 4.54 \mathrm{ft}$
D. $\quad 10.94 \mathrm{ft}$
E. $\quad 432.91 \mathrm{ft}$

From the topographic data given in the figure below, answer the following four questions.

7. Estimate the elevation of Point A?
A. $\quad 65 \mathrm{ft}$
B. 68 ft
C. $\quad 70 \mathrm{ft}$
D. $\quad 73 \mathrm{ft}$
E. $\quad 75 \mathrm{ft}$
8. Which of the following values is most nearly slope between Point $A$ and Point $B$ ?
A. $1 \%$
B. $3 \%$
C. $5 \%$
D. $7 \%$
E. 9\%
9. For the following site data, what would be an appropriate square grid spacing to develop a contour map using one-foot intervals?
A. 5 foot
B. 10 foot
C. 15 foot
D. 20 foot
E. 25 foot

| Side | Distance |
| :---: | :---: |
| $A B$ | 100.0 |
| BC | 150.0 |
| CD | 200.0 |
| DA | 100.0 |


| Point | Elevation |
| :---: | :---: |
| A | 100.0 |
| B | 105.0 |
| C | 108.0 |
| D | 105.0 |

Consider the linear-elastic prismatic bar fixed on the left-hand-side and loaded by an axial force at the right-handside, as shown in figure below.

10. If the bar fails at strains greater than 0.05 , what is the largest allowable deformation of bar to prevent failure?
A. 11 inches
B. 9 inches
C. 7 inches
D. 5 inches
E. 2 inches
11. If the bar yields at a deformation of 0.25 inches under an axial load, estimate the yield stress in the material if the modulus of elasticity of $29,000 \mathrm{ksi}$ ?
A. 20 ksi
B. 40 ksi
C. $\quad 60 \mathrm{ksi}$
D. 80 ksi
E. 100 ksi
12. What is the deformation of the bar shown above if its cross-sectional area is $0.5 \mathrm{in}^{2}$ and the modulus of elasticity of the material is $29,000 \mathrm{ksi}$ ?
A. 0.03 inches
B. 0.31 inches
C. 0.62 inches
D. $\quad 1.25$ inches
E. 2.50 inches

Construct ten beams, each having the dimensions shown in the figure below. Include a "make-sure-you-haveenough" factor of 1.2 in your mix calculations. Assume a w/c ratio of 0.35 and a mix design of 1:2:3. All weights should be reported to the nearest quarter-pound. Assume concrete weights $145 \mathrm{lb} / \mathrm{tt}^{3}$.

13. The total volume of concrete required for this application is estimated to be:
A. $\quad 1,080 \mathrm{in}^{3}$
B. $2,700 \mathrm{in}^{3}$
C. $7,200 \mathrm{in}^{3}$
D. $8,640 \mathrm{in}^{3}$
E. $\quad 9,640 \mathrm{in}^{3}$
14. The weight of cement required to make 600 lbs of the concrete mix describe above is:
A. 40 lbs
B. $\quad 60 \mathrm{lbs}$
C. 80 lbs
D. $\quad 100 \mathrm{lbs}$
E. $\quad 120 \mathrm{lbs}$
15. The weight of course aggregate required to make 300 lbs of the concrete mix describe above is:
A. 75 lbs
B. 100 lbs
C. $\quad 125 \mathrm{lbs}$
D. 150 lbs
E. $\quad 175 \mathrm{lbs}$

From the data given below, develop a particle-size distribution plot. Use the table and blank graph shown below:

| Sieve Number | Diameter <br> $(\mathrm{mm})$ |  | Mass of Soil Retained <br> on Each Sieve (g) |  | Percent <br> Retained (\%) |
| :---: | :---: | :---: | :---: | :---: | :---: |
| \% Retained |  |  |  |  |  | | Cumulative |
| :---: |
| Finer (\%) | | Percent |
| :---: |
| F |



Use the above sieve analysis to answer the following three questions.
16. The percent passing the \#30 sieve may be most closely approximated as:
A. $100 \%$
B. $80 \%$
C. $40 \%$
D. $20 \%$
E. $10 \%$
17. The effective size of the soil may be most closely approximated as:
A. $\quad 0.01 \mathrm{~mm}$
B. $\quad 0.10 \mathrm{~mm}$
C. $\quad 0.20 \mathrm{~mm}$
D. $\quad 0.25 \mathrm{~mm}$
E. $\quad 0.40 \mathrm{~mm}$

Consider the particle-size distribution plot shown below.

18. The effective size of the soil shown in the graph above is most closely approximated by:
A. $\quad 0.3 \mathrm{~mm}$
B. 0.4 mm
C. $\quad 0.5 \mathrm{~mm}$
D. 0.6 mm
E. $\quad 0.7 \mathrm{~mm}$
19. The particle-size $D_{30}$ is most closely approximated as:
A. $\quad 0.55 \mathrm{~mm}$
B. $\quad 0.65 \mathrm{~mm}$
C. $\quad 0.75 \mathrm{~mm}$
D. $\quad 0.85 \mathrm{~mm}$
E. $\quad 1.05 \mathrm{~mm}$
20. Which of the following filtration mechanisms is not involved in removing suspended solids in a granularmedia filter?
A. interception
B. straining
C. flocculation
D. hydration
E. sedimentation
21. The hydraulic loading rate in the 3.5 inch diameter filters in lab, with a flowrate of $1,250 \mathrm{ml} / \mathrm{min}$, is most nearly approximated as:
A. $\quad 1.0 \mathrm{gpm} / \mathrm{tt}^{2}$
B. $\quad 2.0 \mathrm{gpm} / \mathrm{tt}^{2}$
C. $\quad 3.0 \mathrm{gpm} / \mathrm{t}^{2}$
D. $\quad 4.0 \mathrm{gpm} / \mathrm{tt}^{2}$
E. $\quad 5.0 \mathrm{gpm} / \mathrm{tt}^{2}$
22. The backwash velocity required to expand a sand bed filter to a porosity of 0.70 for a sand with a settling velocity is $0.20 \mathrm{ft} / \mathrm{s}$ and the initial porosity of the sand is 0.35 is most nearly approximated as:
A. $\quad 0.01 \mathrm{ft} / \mathrm{s}$
B. $\quad 0.03 \mathrm{ft} / \mathrm{s}$
C. $\quad 0.04 \mathrm{ft} / \mathrm{s}$
D. $\quad 0.05 \mathrm{ft} / \mathrm{s}$
E. $\quad 0.07 \mathrm{ft} / \mathrm{s}$

| Initial NTU | time <br> (min) | Flowrate (ml/min) | Turbidity (NTU) | $\begin{gathered} \mathrm{V} \\ (\mathrm{ml}) \end{gathered}$ | Average Turbidity (NTU) |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | 0 | 1000 | 2 | --- | --- |
|  | 10 | 1000 | 2 |  |  |
|  | 20 | 900 | 3 |  |  |
| 100 | 30 | 900 | 5 |  |  |
|  | 40 | 800 | 6 |  |  |
|  | 50 | 800 | 8 |  |  |
|  | 60 | --- | 10 |  |  |

23. The results of a filter run, operated in a manner identical to that used in lab, are shown in the table above. Which of the following volumes most closely estimates the total volume treated after 60 minutes?
A. $24,000 \mathrm{ml}$
B. $36,000 \mathrm{ml}$
C. $48,000 \mathrm{ml}$
D. $54,000 \mathrm{ml}$
E. $72,000 \mathrm{ml}$
24. Which of the following values most closely estimates the average turbidity after 60 minutes?
A. 0 NTU
B. 3 NTU
C. 5 NTU
D. 7 NTU
E. 9 NTU
25. If the average turbidity is 10 NTU at the end of 60 minutes, which of the following values most closely estimates the \%NTU removed?
A. $100 \%$
B. $95 \%$
C. $90 \%$
D. $85 \%$
E. $80 \%$

Equation Sheet

$$
v=v_{s} \alpha_{e}^{4.5} \quad L_{e}=\frac{L(1-\alpha)}{1-\left(v / v_{s}\right)^{0.22}}
$$

7.48 gallons $=1 \mathrm{ft}^{3}$
3.785 liters $=1$ gallon

